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THERMAL SURVEILLANCE OF ACTIVE VOLCANOES

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a. Title: Thermal Surveillance of Active Volcanoes

ERTS-A Proposal No.: SR 251

b. GSFC ID No. of P.I.: IN 023

c. Emplacement of Mt. St. Helens, Washington, DCP (#6066) equipment at its preselected field site, the last of six sets, is dependent on satisfactory weather conditions near the summit; installation is anticipated late this spring.

d. DCP (#6251) was installed on the north slope of Mt. Baker, Washington, near the summit, on February 8, 1973, and has been operating and transmitting thermistor-derived temperature data satisfactorily since then.

DCP #6066, designated for Mt. St. Helens has been operating and transmitting satisfactorily from a laboratory environment during the winter. DCP sets #6056 (Surtsey, Iceland), #6020 Bumpass Hell, and #6104 Devil's Kitchen, Lassen Volcanic National Park, California, have all yielded good quality temperature data suitable for computer processing.

e. The U.S. Geological Survey IBM 360/65 program designed for this experiment records and plots temperature, radiance and anomalous heat flow values as a function of time utilizing the Stefan-Boltzmann function, where radiance,  $W = \epsilon 1.356 \times 10^{-12} [T^4 - T_o^4]$ . DCP thermistor probes provide time-dependent values of T, the ground surface temperature, and  $T_o$ , the air temperature. Anomalous near-surface

heat flow is analyzed by the empirical relationship  $H = 1.24T_{15}^4 \times 10^{-6} \text{ cal/m}^2 \cdot \text{sec}$ , where the  $T_{15}$  values which are temperatures at 15 cm depth are related to surface, 50 cm, and 100 cm depth temperatures.

At Devil's Kitchen, Lassen Volcanic National Park, preliminary data processing suggests that during the early winter period, temperatures at 15 cm depth in this active geothermal area showed a 68% correlation with fluctuations of anomalous surface temperatures; and temperatures at 50 cm depth showed an 8% correlation with surface temperature fluctuations.

A preliminary estimate of the anomalous heat flow at the Devil's Kitchen infrared (thermal) anomaly is  $0.75 \times 10^6 \text{ cal} \cdot \text{sec}^{-1}$  over an area of  $41,600 \text{ M}^2$ . At the Boiling Springs Lake anomaly, controlled by the same fault system, thermal radiation from the lake surface alone (not considering evaporative heat loss) was calculated to be  $0.71 \times 10^6 \text{ cal} \cdot \text{sec}^{-1}$ .

- f. Thermal surveillance of Cascade Range volcanoes using ERTS-I multispectral scanner, aircraft imaging systems, and ground-based data communication platforms, by Jules D. Friedman, David G. Frank, Duane Preble and J. Earle Painter, for ERTS-I Symposium Proceedings, March, 1973.
- k. Status of Data Collection Platforms: As above.